

REMARKS

This is in response to the Office Action dated July 17, 2009. Claims 4-34 are pending and stand rejected in the outstanding Office Action. Claim 4 has been amended.

The rejection of claims 4-34 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite, is respectfully traversed.

The Examiner stated that, regarding claim 4, it is not clear “with respect to what voltage the recited “threshold voltage” is measured; it is not clear “how close to “0 V” would be “about 0 V”; it is not clear what a “threshold voltage of the semiconductor device” being “restrained” refers to; and finally it is not clear “whether Applicants claim that the threshold voltage of the semiconductor device is restrained forever and under any operating condition, which may not be enabling”, see p. 2 of the Office Action.

With the amendment made to claim 4, it is made clear that the threshold voltage refers to the gate voltage of the semiconductor device (see p. 5, line 24 to p. 6, line 14 and Figs. 15 and 17 of the instant specification). Moreover, a specific range for the threshold voltage is explicitly recited to overcome the Examiner’s rejection. Further, claim 4, by reciting that “said active layer includes said nitrogen and hydrogen as intentionally added dopants” so that the gate voltage is within the claimed range, ensures that the threshold voltage is within the claimed range forever, since the intentionally added dopants are within the active layer forever. Finally, the word “restrained” has been deleted to avoid confusion.

The rejection of claim 4 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Kawasaki et al. (US 2003/0047785) in view of Goodman (US 4,204,217) and further in view of Yan et al. (US 2003/0218222), is respectfully traversed.

Amended claim 4 now recites “said active layer includes said nitrogen and hydrogen as intentionally added dopants so that a threshold voltage of the gate voltage of the semiconductor device is in the range of approximately 0V to 3V”. Support for the amendment can be found, for example, in p. 69, lines 18-24 of the instant specification. Kawasaki/Goodman/Yan fails to teach or suggest this feature.

The Examiner admitted that Kawasaki/Goodman/Yan fails to teach that hydrogen is intentionally added to the active layer, wherein a threshold voltage of the semiconductor device is restrained to be about 0 V. However, the Examiner asserted that it would have been obvious, if not inherent, that the active layer disclosed by Kawasaki/Goodman/Yan, may be unintentionally doped with hydrogen. According to the Examiner, “in this case, a threshold voltage of the semiconductor device is inherently restrained to be about 0 V, because Applicants do not specifically define how close to “0 V” would be about 0 V”, and at what point of device operation over time and under what operating conditions the threshold voltage is restrained to be about 0 V”. Finally, the Examiner stated that “the limitation “said nitrogen and hydrogen are intentionally added to the active layer” is a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art, unless Applicants specifically claim a concentration of the nitrogen and hydrogen intentionally added to the active layer”, see p. 5 of the Office Action.

With the above amendment to claim 4, all limitations are positive limitations for an apparatus claim. For example, “wherein said active layer includes said nitrogen and hydrogen as intentionally added dopants” is a positive limitation for an apparatus claim. Moreover, claim 4 now recites that the threshold voltage of the gate voltage is within a specific range, e.g., approximately between 0V and 3V. None of the cited references teaches the above specific

range for the threshold voltage under unintentional or intentional doping with hydrogen. First, under unintentional hydrogen doping, which corresponds to the solid curve in Fig. 15 of the instant specification, the threshold voltage is much more negative than the claimed threshold voltage. Second, Kawasaki/Goodman/Yan do not teach intentional hydrogen doping.

The effect of using the threshold value in this range is that in cases where the thin film transistor is applied to such a liquid crystal display device, the threshold voltage can be set appropriately by controlling the doping amount (i.e., intentionally adding nitrogen and hydrogen, as required in the amended claim 4), see p. 69, lines 21-24 of the instant specification.

Furthermore, while Goodman discloses a “threshold” for turning a transistor “ON” being above zero, i.e., positive, see col. 4, lines 5-67 in Goodman, Applicant has already pointed out (see Response of December 4, 2008, p. 12) that Goodman does not consider any form of control for this threshold voltage. Therefore, Goodman is unsuitable for teaching the specific range recited in amended claim 4. Moreover, none of the other cited prior art references disclose any form of a threshold voltage range.

For the above reasons, claim 4 is allowable.

Regarding claim 5, the Examiner cited the new reference of Vijayakumar (US 4,751,149), as allegedly teaching the limitation of forming the active layer under an atmosphere containing hydrogen peroxide.

Vijayakumar teaches using hydrogen peroxide as an oxidant in a chemical vapor deposition process for depositing ZnO films, see col. 2, lines 1-6, 24-29 and 38-39. However, Vijayakumar does not disclose a range for the threshold voltage, hence this new reference does not cure the deficiencies of Kawasaki/Goodman/Yan.

It is respectfully requested that the rejection of claims 5-34, each one dependent from claim 4, also be withdrawn.

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

Respectfully submitted,

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